Medical School Library
MAY 12 1942
University of California

WEEKLY BULLETIN

CALIFORNIA STATE DEPARTMENT OF PUBLIC HEALTH
ESTABLISHED APRIL 15, 1870
BERTRAM P. BROWN, M.D., Director

STATE BOARD OF PUBLIC HEALTH

DR. A. ELMER BELT, President
Los Angeles

DR. F. M. POTTENGER, SR., Vice-President
Los Angeles

DR. BERTRAM P. BROWN, Executive Officer
Sacramento

DR. V. A. ROSSITER
Santa Ana

DR. NORMAN F. SPRAGUE
Los Angeles

DR. CHARLES E. SMITH
San Francisco

DR. JAMES F. RINEHART
San Francisco

ENTERED AS SECOND-CLASS MATTER FEB. 21, 1922, AT THE POST OFFICE AT SACRAMENTO, CALIFORNIA, UNDER THE ACT OF AUG. 24, 1912. ACCEPTANCE FOR MAILING AT THE SPECIAL RATE OF POSTAGE PROVIDED FOR IN SECTION 1103, ACT OF OCT. 3, 1917

SACRAMENTO, STATE OFFICE BLDG., 10TH AND L STS., 2-4711 SAN FRANCISCO, 603 PHELAN BLDG., 760 MARKET ST., UN 8700 LOS ANGELES, STATE OFFICE BLDG., 217 W. FIRST ST., MA 1271

VOL. XXI, No. 13 APRIL 18, 1942 GUY P. JONES Editor

OCCUPATIONAL HEALTH HAZARDS IN AIRCRAFT PRODUCTION

JOHN P. RUSSELL, M.D.,* Chief, Industrial Hygiene Service, California Department of Public Health

and

FRED R. INGRAM, B.A., Supervising Engineer, Industrial Hygiene Service, California Department of Public Health, Berkeley, California

To fulfill the urgent needs of the National Preparedness Program, the aircraft production industry in California has undergone a rapid growth, with 56 per cent of all Government contracts for aircraft and parts and an increase of employment of over 200 per cent during the past year. This expansion has been accompanied by an increasing consciousness on the part of plant executives of the importance of conserving the health and strength of their employees in order that production schedules may be maintained at peak efficiency.

This interest in health protection is evidenced by the fact that during the past six months, studies of potential occupational health hazards have been made by the California Department of Public Health, at the request of company officials, in all of the major aircraft production plants in the State, which employ a total of more than 90,000 workers. Each of these plants has its own safety, medical and nursing services. The safety engineers of the various companies have formed an association for the interchange of ideas and experiences in the practical solution of their safety and health problems. The Industrial Hygiene Service is cooperating with this organization by providing engineering, medical and laboratory assistance in the evaluation and correction of working conditions which may be detrimental to health.

Many processes and operations in the manufacture of aircraft involve the exposure of workers to potentially harmful gases, fumes, dusts, vapors, chemicals and skin irritants. These processes include the making of wood and plaster patterns for dies; the pouring of lead and zinc dies for drop hammers, which form duralumin sheets into required shapes; the construction of jigs, or racks, for assembling parts; the cleaning and plating of metal parts; the preparation of control cables and electric wiring; the painting of parts, subassemblies and planes, and the preparation of rudders and movable wing parts from cloth, which is treated with a nitrate dope. Since there are no aircraft engine manufacturing plants in California at present, the hazards associated with this branch of the industry are not discussed in this paper.

Health hazards found in these processes are the same as those which are encountered in similar types of work in other industries. No process or operation in aircraft manufacture is peculiar to that industry, except possibly the coating of fabric surfaces with a special type of quick-drying paint, known as "dope," and the puncture-proofing of gasoline tanks.

In the pattern shops, dust is created by woodworking machinery, such as belt and disk sanders. These machines should be equipped with exhaust ventilation to trap the wood and sand dust at its source and carry it to a dust collector, thus preventing its dissemination into the workroom atmosphere. In some cases patterns are made from mahogany, and dermatitus has developed in a few employees as a result of sensitivity to this wood. Makers of such patterns should be provided with protective clothing to prevent the wood or its dust from coming into contact with the skin. In the making of plaster patterns, contact of the hands and arms with stearic acid, kerosene and beeswax may cause irritation of the skin, which can be prevented by wearing impervious gloves and sleeves.

---

* Deceased.

In the foundry, fumes from lead melting pots are controlled by hooding the pots and equipping them with exhaust ventilation. The health hazard of the zinc or Kirksite melting pots is less serious than that of the lead melting pots, but zinc oxide fumes may cause metal fume fever and therefore should be trapped at their source and removed by exhaust ventilation.

The molten lead and zinc are poured into molds to form dies. After cooling, the dies are ground and scraped to remove irregularities. This process creates dust; therefore, the work should be done in booths or enclosures equipped with lateral or downdraft exhaust ventilation to draw the dust away from the worker's face.

In some plants, dies are fastened into place in the bases of drop hammers by pouring molten lead around their edges. The portable pots in which the lead is melted should be provided with hoods and exhaust ventilation to protect employees from lead fumes. Lead spilled on the floor is ground into dust by the feet, and lead dust is created by the wearing away of dies and is thrown into the air by the vibrations of the falling hammers. This hazard should be controlled by frequent vacuum cleaning of floors and machines in the drop hammer department.

At various stages in aircraft manufacturing and assembling, duralumin and stainless steel parts are cleaned with alkalis, such as sodium hydroxide (caustic soda), and with degreasing solvents, such as trichlorethylene, carbon tetrachloride and paint thinners. Alkali tanks should be equipped with exhaust ventilation, and precautions should be taken to prevent contact of caustic with the skin or splashes into the eyes. Vapors from degreasing tanks are injurious to the liver, kidneys and nervous system when they are breathed in high concentrations or over prolonged periods. They should be controlled by cooling coils in the upper part of the tank to condense the vapors, supplemented by lateral horizontal slot exhaust ventilation to trap vapors which may escape condensation. Toxic volatile solvents used in small containers should be located in well ventilated booths.

Some persons are sensitive to the resin or oil with which raw duralumin stock is coated to prevent scratching in shipment or to zinc chromate, which is sprayed on some of the metal sheets. Dermotoses from these substances may be prevented by wearing of protective clothing.

Solvents, such as petroleum products, chlorinated hydrocarbons, tuluene and xylene, dissolve natural oils and fats from the skin. Employees handling or exposed to these solvents should wear impervious clothing and should rub a mixture of hydrous wool fat and castor oil on the hands and arms to prevent the skin from drying and cracking. For the same reason, sulfonated vegetable oils are preferable to strong soaps for cleaning the skin.

Some cast-steel airplane parts are cleaned by sand or steel grit, which is blasted over them by air pressure. When sand is used as the abrasive agent, a potential silica dust hazard is created. Health protection in this operation is provided by enclosing sand-blasting operations in dust-tight cabinets under negative pressure, with the operator working outside of the cabinet, or, in those cases in which the sand blaster must work inside the cabinet, by fitting him with a helmet covering the head and shoulders and connected with a hose which supplies him with a continuous stream of fresh, dust-free air from an outside source, under sufficient pressure to prevent the entrance of dust into the helmet.

In the machine shops, metal parts are cut, turned and drilled to required sizes and shapes. Airplane fuselage frames are made from steel tubes; jigs, or racks, are made from tubing and bar stock, and parts are welded with oxyacetylene torches, the electric arc and resistance (spot) welding. Cutting and lubricating oils used on metal working machinery are occasionally the cause of cutaneous disorders, which may be prevented by the use of impervious clothing and frequent cleansing and greasing of the skin.

During welding operations, oxides of nitrogen, carbon monoxide and fluoride fumes are generated. Protection against the inhalation of these atmospheric contaminants is provided by conducting welding operations, wherever practicable, in booths equipped with exhaust ventilation. Ultraviolet and infra-red rays emanating from the welding arc or torch may cause severe irritation and inflammation of the eyes unless welders and their helpers wear approved helmets or goggles. Welding operations should be shielded by screens or booths to prevent exposure of nearby workers to welding rays.

Some metal airplane parts are cleaned by immersion in alkali; some are "pickled" by immersion in nitric, hydrochloric or sulfuric acid, and some are treated by both of these processes. Some of the aluminum parts are then hardened by electrolytic treatment with chromic acid, and stainless steel parts are electroplated with cadmium. Chromic acid vapors, which may cause ulcers of the skin and nasal septum, are controlled by lateral horizontal slot exhaust ventilation of the chromeanodizing tanks. The same method is employed for the control of cadmium and hydrogen cyanide, which might otherwise escape into the workroom atmosphere from the cadmium-plating tanks. Protection of the skin and mucous membranes against the irritating effects of these chemicals is obtained by wearing protective clothing and by applying a film of petrolatum to the lining of the nose.

All cast-steel aircraft parts, such as bolts, which will be subjected to heavy stresses are inspected for flaws by roentgenographic examination or, more commonly, by a process in which they are magnetized and then immersed in a suspension of iron filings in naphtha. Any defect is indicated by the deposition of iron filings at the site of the flaw. In this operation, impervious gloves should be worn to prevent defatting of the skin by the solvent. If roentgen rays are used, the machines are enclosed and shielded to protect the operator from harmful rays.

Some of the small steel aircraft parts are annealed by immersion in pots of "liquid fire," which consists of molten cyanide salts. These pots should be hooded and vented to prevent the escape of cyanides into the workroom atmosphere. At these pots, as well as in the foundry, at heat treat furnaces and in other areas where workmen are subjected to high temperatures, sodium chloride tablets should be provided to prevent heat sickness.

In the assembly of control cables and electrical wiring, some employees work at benches in close proximity to small pots containing solder and molten lead. These pots should be located in ventilated booths or cabinets, to prevent lead fumes from reaching the worker's face.

Airplane parts, subassemblies and completed fuselages and planes are sprayed with paint by hand-operated compressed air spray guns. The thinners in these paints are injurious to health if their vapors or the mists created by the spray guns are breathed in large quantities or over extensive periods. This potential danger is also present in the application to fabric surfaces, by brush and spray gun, of "dopes," or quick-drying cellulose nitrate compounds, which are thinned with toxic volatile solvents, such as toluene, amyl acetate, butyl acetate and acetone. The danger to health involved in exposure to these poisonous vapors may be minimized by conducting spray-painting and doping operations, wherever practicable, in booths provided with exhaust ventilation. If this is not feasible and the work must be done on the open floor, men exposed to paint and dope vapors should wear supplied-air hose masks, and the workroom should have general negative pressure ventilation.

Gas burners are used in many locations throughout the plants, under lead and zinc melting pots, under tanks of alkali and acid, under heat treat pots and for heating workrooms. Tests have shown that potentially dangerous quantities of carbon monoxide may emanate from these burners, due to incomplete combustion of the fuel gas. Therefore, fumes from all fuel-burning appliances should be vented to the outside atmosphere.

In conclusion, it is evident from this partial list that there is a wide diversity of health hazards associated with aircraft production, but that these dangers can be eliminated or minimized by practical, common sense precautions and control measures.—Reprinted from War Medicine by permission of the American Medical Association.

The California State Department of Public Health is proud of the members of its staff who have entered the armed forces of the United States. It is with a sense of great pride that the names of the following men who have entered such forces are listed here:

UNITED STATES NAVY

Lloyd P. Bascom
Alcor Browne
O. L. Butterfield
James R. Keefer
E. B. Mansfield
Don Roberts

UNITED STATES ARMY

Clark Beckwith
Jules Comroe, M.D.
Leon Comroe, M.D.
Joseph Copeland, M.D.
Robert Dyar, M.D.
Edward Hirschberg, M.D.
George Husser, M.D.
Edward Maher, M.D.

UNITED STATES MARINES

John Cruzan

Seldom shall we see in cities, courts, and rich families, where men live plentifully and eat and drink freely, that perfect health and athletic soundness and vigor of constitution which are commonly seen in the country, where nature is the cook and the necessity the caterer, and where they have no other doctor but the sun and fresh air.—South.

MORBIDITY*

Complete Reports for Certain Diseases Recorded for Week Ending April 11, 1942

Chickenpox

1511 cases from the following counties: Alameda 276, Amador 5, Butte 7, Contra Costa 16, Fresno 20, Humboldt 6, Inyo 6, Kern 25, Kings 3, Lassen 2, Los Angeles 525, Monterey 7, Orange 33, Placer 4, Riverside 13, Sacramento 39, San Bernardino 134, San Diego 161, San Francisco 40, San Joaquin 10, San Luis Obispo 3, San Mateo 24, Santa Barbara 27, Santa Clara 80, Santa Cruz 6, Shasta 1, Siskiyou 2, Solano 2, Sonoma 3, Tulare 5, Ventura 18, Yolo 8.

German Measles

1684 cases from the following counties: Alameda 324, Butte 1, Colusa 2, Contra Costa 9, Fresno 34, Kern 36, Kings 3, Los Angeles 144, Madera 3, Marin 20, Mariposa 15, Merced 6, Monterey 3, Orange 12, Riverside 5, Sacramento 6, San Bernardino 11, San Diego 329, San Francisco 302, San Joaquin 103, San Luis Obispo 49, San Mateo 88, Santa Barbara 14, Santa Clara 90, Santa Cruz 1, Shasta 1, Solano 14, Sonoma 29, Tulare 17, Ventura 4, Yolo 7, Yuba 2.

Measles

6843 cases from the following counties: Alameda 677, Amador 168, Butte 107, Colusa 1, Contra Costa 65, El Dorado 25, Fresno 323, Glenn 48, Humboldt 10, Inyo 6, Kern 95, Kings 9, Lake 2, Los Angeles 2263, Madera 48, Marin 16, Mariposa 11, Merced 105, Monterey 11, Napa 2, Nevada 5, Orange 345, Placer 5, Plumas 10, Riverside 33, Sacramento 207, San Bernardino 148, San Diego 838, San Francisco 191, San Joaquin 108, San Luis Obispo 92, San Mateo 64, Santa Barbara 179, Santa Clara 78, Santa Cruz 8, Shasta 7, Siskiyou 3, Solano 163, Sonoma 75, Stanislaus 5, Sutter 19, Tehama 9, Tulare 77, Ventura 73, Yolo 104, Yuba 4, California 1.**

Mumps

1824 cases from the following counties: Alameda 327, Butte 7, Contra Costa 11, Del Norte 7, Fresno 61, Humboldt 4, Inyo 12, Kern 31, Kings 3, Lassen 2, Los Angeles 326, Madera 3, Marin 7, Merced 3, Monterey 13, Napa 5, Orange 51, Placer 1, Riverside 3, Sacramento 66, San Bernardino 272, San Diego 238, San Francisco 76, San Joaquin 98, San Luis Obispo 20, San Mateo 16, Santa Barbara 25, Santa Clara 38, Santa Cruz 12, Shasta 2, Solano 3, Sonoma 29, Stanislaus 2, Sutter 2, Tehama 16, Tulare 11, Ventura 9, Yolo 8, Yuba 4.

Scarlet Fever

89 cases from the following counties: Alameda 4, Butte 1, Fresno 7, Humboldt 1, Inyo 2, Los Angeles 29, Marin 1, Orange 1, Riverside 9, San Bernardino 7, San Diego 4, San Francisco 7, San Joaquin 4, San Mateo 1, Santa Barbara 1, Santa Clara 5, Tulare 4, Yolo 1.

Whooping Cough

306 cases from the following counties: Alameda 39, Butte 2, Fresno 17, Humboldt 4, Kern 10, Kings 1, Lake 1, Los Angeles 68, Madera 3, Marin 1, Mendocino 2, Monterey 1, Nevada 2, Orange 9, Plumas 2, Sacramento 34, San Bernardino 21, San Diego 9, San Francisco 6, San Joaquin 11, San Luis Obispo 12, San Mateo 3, Santa Barbara 9, Santa Clara 22, Shasta 2, Sonoma 3, Sutter 3, Tulare 2, Ventura 5, Yolo 2.

Coccidioidal Granuloma

One case from Fresno County.

Diphtheria

9 cases from the following counties: Los Angeles 7, San Bernardino 1, San Joaquin 1.

Encephalitis (Epidemic)

2 cases from the following counties: San Luis Obispo 1, Tulare 1.

Epilepsy

38 cases from the following counties: Alameda 2, Los Angeles 29, Orange 1, Riverside 1, San Francisco 5.

Food Poisoning

2 cases from San Luis Obispo County.

Influenza

508 cases reported in the State.

Jaundice (Epidemic)

47 cases from the following counties: Humboldt 1, Kern 1, Los Angeles 1, Riverside 43, San Francisco 1.

Meningitis (Epidemic)

5 cases from the following counties: Lassen 1, Los Angeles 4.

Rabies (Animal)

14 cases from Los Angeles County.

Rheumatic Fever

5 cases from the following counties: Contra Costa 1, Los Angeles 2, San Francisco 2.

Septic Sore Throat

One case from San Mateo County.

Tetanus

2 cases from Los Angeles County.

Typhoid Fever

3 cases from the following counties: Alameda 1, Riverside 1, Sacramento 1.

Undulant Fever

3 cases from the following counties: San Bernardino 2, San Francisco 1.

MERCURY VAPOR STUDIES IN QUICKSILVER MINES

Studies of the atmospheric concentration of mercury vapor and sulfur dioxide were made recently in two quicksilver mines. Tests were made at the hot waste rock dumping operations, from the furnace chute to the dump itself. The chute from the furnace goes directly into the ground at the plant, and discharges into hopper cars inside a 100 ft. tunnel. The concentration of mercury vapor in this tunnel was particularly high. Tests for mercury vapor and sulfur dioxide were also taken at the feed end of the rotary furnace and at the hoe table where the alkali-treated ore is hoed by hand.

The rural dweller in the United States has, on the average, four or five years longer life than the urban resident. Among white males dwelling in rural areas the average length of life is 62.09 years, while for urban residents, it is 56.73 years. The corresponding figures for white females are 65.09 years and 61.05 years. These figures are based on the calendar year 1930.—Louis L. Dublin, Ph. D.

---

* Data regarding the other reportable diseases not listed herein, may be obtained upon request.

** Cases charged to "California" represent patients ill before entering the State or those who contracted their illness traveling about the State throughout the incubation period of the disease. These cases are not chargeable to any one locality.

printed in CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO, *1942* GEORGE H. MOORE, STATE PRINTER 11677 4-42 7500

University of California
Medical Library,
3rd & Parnassus Aves.,
San Francisco, Calif.